

Important Geometrical Properties of Trapezoidal Channel Section Formulas PDF



Formulas
Examples
with Units

List of 17 Important Geometrical Properties of Trapezoidal Channel Section Formulas

1) Depth of Flow given Top Width for Trapezoidal Formula ↻

Formula

$$d_{f(\text{trap})} = \frac{T_{\text{Trap}} - B_{\text{trap}}}{2 \cdot z_{\text{trap}}}$$

Example with Units

$$3.3011 \text{ m} = \frac{7.62 \text{ m} - 3.8105 \text{ m}}{2 \cdot 0.577}$$

Evaluate Formula ↻

2) Depth of Flow given Wetted Perimeter for Trapezoidal Formula ↻

Formula

$$d_{f(\text{trap})} = \frac{P_{\text{Trap}} - B_{\text{trap}}}{2 \cdot \left(\sqrt{z_{\text{trap}} \cdot z_{\text{trap}} + 1} \right)}$$

Example with Units

$$3.2998 \text{ m} = \frac{11.43 \text{ m} - 3.8105 \text{ m}}{2 \cdot \left(\sqrt{0.577 \cdot 0.577 + 1} \right)}$$

Evaluate Formula ↻

3) Hydraulic Depth for Trapezoidal Formula ↻

Formula

$$D_{\text{Trap}} = \frac{(B_{\text{trap}} + d_{f(\text{trap})} \cdot z_{\text{trap}}) \cdot d_{f(\text{trap})}}{B_{\text{trap}} + 2 \cdot d_{f(\text{trap})} \cdot z_{\text{trap}}}$$

Example with Units

$$2.4877 \text{ m} = \frac{(3.8105 \text{ m} + 3.32 \text{ m} \cdot 0.577) \cdot 3.32 \text{ m}}{3.8105 \text{ m} + 2 \cdot 3.32 \text{ m} \cdot 0.577}$$

Evaluate Formula ↻

4) Hydraulic Radius of Section Formula ↻

Formula

$$R_{H(\text{Trap})} = \frac{(B_{\text{trap}} + z_{\text{trap}} \cdot d_{f(\text{trap})}) \cdot d_{f(\text{trap})}}{B_{\text{trap}} + 2 \cdot d_{f(\text{trap})} \cdot \sqrt{z_{\text{trap}}^2 + 1}}$$

Example with Units

$$1.6565 \text{ m} = \frac{(3.8105 \text{ m} + 0.577 \cdot 3.32 \text{ m}) \cdot 3.32 \text{ m}}{3.8105 \text{ m} + 2 \cdot 3.32 \text{ m} \cdot \sqrt{0.577^2 + 1}}$$

Evaluate Formula ↻



5) Section Factor for Trapezoidal Formula

Formula

$$Z_{\text{Trap}} = \frac{\left(\left(\left(B_{\text{trap}} + d_{f(\text{trap})} \cdot z_{\text{trap}} \right) \cdot d_{f(\text{trap})} \right) \right)^{1.5}}{\sqrt{B_{\text{trap}} + 2 \cdot d_{f(\text{trap})} \cdot z_{\text{trap}}}}$$

Evaluate Formula 

Example with Units

$$29.9849_{\text{m}^2.5} = \frac{\left(\left(\left(3.8105_{\text{m}} + 3.32_{\text{m}} \cdot 0.577 \right) \cdot 3.32_{\text{m}} \right) \right)^{1.5}}{\sqrt{3.8105_{\text{m}} + 2 \cdot 3.32_{\text{m}} \cdot 0.577}}$$

6) Side Slope of Section given Hydraulic Depth Formula

Formula

$$z_{\text{trap}} = \frac{B_{\text{trap}} \cdot d_{f(\text{trap})} - B_{\text{trap}} \cdot D_{\text{Trap}}}{2 \cdot D_{\text{Trap}} \cdot d_{f(\text{trap})} - (d_{f(\text{trap})})^2}$$

Example with Units

$$0.6022 = \frac{3.8105_{\text{m}} \cdot 3.32_{\text{m}} - 3.8105_{\text{m}} \cdot 2.47_{\text{m}}}{2 \cdot 2.47_{\text{m}} \cdot 3.32_{\text{m}} - (3.32_{\text{m}})^2}$$

Evaluate Formula 

7) Side Slope of Section given Perimeter Formula

Formula

$$z_{\text{trap}} = \sqrt{\left(\left(\frac{P_{\text{Trap}} - B_{\text{trap}}}{2 \cdot d_{f(\text{trap})}} \right)^2 \right)} - 1$$

Example with Units

$$0.5628 = \sqrt{\left(\left(\frac{11.43_{\text{m}} - 3.8105_{\text{m}}}{2 \cdot 3.32_{\text{m}}} \right)^2 \right)} - 1$$

Evaluate Formula 

8) Side Slope of Section given Top Width for Trapezoidal Formula

Formula

$$z_{\text{trap}} = \frac{T_{\text{Trap}} - B_{\text{trap}}}{2 \cdot d_{f(\text{trap})}}$$

Example with Units

$$0.5737 = \frac{7.62_{\text{m}} - 3.8105_{\text{m}}}{2 \cdot 3.32_{\text{m}}}$$

Evaluate Formula 

9) Side Slope of Section given Wetted Area of Trapezoidal Formula

Formula

$$z_{\text{trap}} = \frac{\left(\frac{S_{\text{Trap}}}{d_{f(\text{trap})}} \right) - B_{\text{trap}}}{d_{f(\text{trap})}}$$

Example with Units

$$0.5633 = \frac{\left(\frac{18.86_{\text{m}^2}}{3.32_{\text{m}}} \right) - 3.8105_{\text{m}}}{3.32_{\text{m}}}$$

Evaluate Formula 



10) Top Width for Trapezoidal Formula

Formula

$$T_{\text{Trap}} = B_{\text{trap}} + 2 \cdot d_{f(\text{trap})} \cdot z_{\text{trap}}$$

Example with Units

$$7.6418\text{m} = 3.8105\text{m} + 2 \cdot 3.32\text{m} \cdot 0.577$$

Evaluate Formula 

11) Wetted Area for Trapezoidal Formula

Formula

$$S_{\text{Trap}} = (B_{\text{trap}} + z_{\text{trap}} \cdot d_{f(\text{trap})}) \cdot d_{f(\text{trap})}$$

Example with Units

$$19.0108\text{m}^2 = (3.8105\text{m} + 0.577 \cdot 3.32\text{m}) \cdot 3.32\text{m}$$

Evaluate Formula 

12) Wetted Perimeter for Trapezoidal Formula

Formula

$$P_{\text{Trap}} = B_{\text{trap}} + 2 \cdot d_{f(\text{trap})} \cdot \left(\sqrt{z_{\text{trap}} \cdot z_{\text{trap}} + 1} \right)$$

Example with Units

$$11.4765\text{m} = 3.8105\text{m} + 2 \cdot 3.32\text{m} \cdot \left(\sqrt{0.577 \cdot 0.577 + 1} \right)$$

Evaluate Formula 

13) Width of Section given Hydraulic Depth Formula

Formula

$$B_{\text{trap}} = \frac{(d_{f(\text{trap})} \cdot z_{\text{trap}} \cdot d_{f(\text{trap})}) - D_{\text{Trap}} \cdot 2 \cdot d_{f(\text{trap})} \cdot z_{\text{trap}}}{D_{\text{Trap}} - d_{f(\text{trap})}}$$

Example with Units

$$3.651\text{m} = \frac{(3.32\text{m} \cdot 0.577 \cdot 3.32\text{m}) - 2.47\text{m} \cdot 2 \cdot 3.32\text{m} \cdot 0.577}{2.47\text{m} - 3.32\text{m}}$$

Evaluate Formula 

14) Width of Section given Top Width Formula

Formula

$$B_{\text{trap}} = T_{\text{Trap}} - 2 \cdot d_{f(\text{trap})} \cdot z_{\text{trap}}$$

Example with Units

$$3.7887\text{m} = 7.62\text{m} - 2 \cdot 3.32\text{m} \cdot 0.577$$

Evaluate Formula 

15) Width of Section given Wetted Area for Trapezoidal Formula

Formula

$$B_{\text{trap}} = \left(\frac{S_{\text{Trap}}}{d_{f(\text{trap})}} \right) - (z_{\text{trap}} \cdot d_{f(\text{trap})})$$

Example with Units

$$3.7651\text{m} = \left(\frac{18.86\text{m}^2}{3.32\text{m}} \right) - (0.577 \cdot 3.32\text{m})$$

Evaluate Formula 



16) Width of Section given Wetted Perimeters in Section Formula

Formula

Evaluate Formula 

$$B_{\text{trap}} = P_{\text{Trap}} - 2 \cdot d_{f(\text{trap})} \cdot \left(\sqrt{z_{\text{trap}} \cdot z_{\text{trap}} + 1} \right)$$

Example with Units

$$3.764 \text{ m} = 11.43 \text{ m} - 2 \cdot 3.32 \text{ m} \cdot \left(\sqrt{0.577 \cdot 0.577 + 1} \right)$$

17) Width of Sections given Hydraulic Radius Formula

Formula

Evaluate Formula 

$$B_{\text{trap}} = \frac{2 \cdot R_{H(\text{Trap})} \cdot d_{f(\text{trap})} \cdot \sqrt{z_{\text{trap}}^2 + 1} - z_{\text{trap}} \cdot d_{f(\text{trap})}^2}{d_{f(\text{trap})} - R_{H(\text{Trap})}}$$

Example with Units




$$3.7659 \text{ m} = \frac{2 \cdot 1.65 \text{ m} \cdot 3.32 \text{ m} \cdot \sqrt{0.577^2 + 1} - 0.577 \cdot 3.32 \text{ m}^2}{3.32 \text{ m} - 1.65 \text{ m}}$$



Variables used in list of Geometrical Properties of Trapezoidal Channel Section Formulas above

- **B_{trap}** Width of Trap Channel (Meter)
- **$d_{\text{f(trap)}}$** Depth of Flow of Trapezoidal Channel (Meter)
- **D_{Trap}** Hydraulic Depth of Trapezoidal Channel (Meter)
- **P_{Trap}** Wetted Perimeter of Trapezoidal Channel (Meter)
- **$R_{\text{H(Trap)}}$** Hydraulic Radius of Trapezoidal Channel (Meter)
- **S_{Trap}** Wetted Surface Area of Trapezoidal Channel (Square Meter)
- **T_{Trap}** Top Width of Trapezoidal Channel (Meter)
- **Z_{trap}** Side slope of Trapezoidal Channel
- **Z_{Trap}** Section Factor of Trapezoidal (Meter^{2.5})

Constants, Functions, Measurements used in list of Geometrical Properties of Trapezoidal Channel Section Formulas above







- **Functions:** **sqrt**, **sqrt(Number)**
A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Area** in Square Meter (m²)
Area Unit Conversion 
- **Measurement:** **Section Factor** in Meter^{2.5}
Section Factor Unit Conversion 



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